

RECENT DISCOVERIES IN THE NEWFOUNDLAND FLORA

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(Continued from page 140)

AGROPYRON § GOULARDA IN EASTERN NORTH AMERICA.—With four recent monographic studies of North American *Agropyron* one would suppose it possible to place our few plants of this group with relative satisfaction. In 1897 there appeared Scribner & Smith's extensive *Native and Introduced Species of the Genera Hordeum and Agropyron*;¹ in 1905 Piper's brief but critical *Agropyron tenerum and its Allies*;² in 1910 Pease & Moore's *Agropyron caninum and its North American Allies*;³ and in 1932 Malte's *The so-called Agropyron Caninum (L.) Beauv. of North America*.⁴ All four papers are the result of close study and careful consideration but if we accept the conclusions of one of the revisions we find ourselves at odds with the others. The genus is notoriously difficult and individual judgments as to specific and varietal lines are bound to differ; consequently, no one treatment can now be worked out which will be wholly satisfactory to all students. In the area best known to me, the region from southern Labrador and Newfoundland to New England and the Great Lakes, the genus has its great development in eastern North America; and assiduous collecting (nearly 300 numbers) of it and close study of its complexities, both in the field and in the herbarium, during a period of forty-five years have given me a bowing acquaintance with the group which makes it difficult to follow, without some divergence, any of the four revisions above noted.

The greatest discrepancies are found in the treatments of § *Goularda*, the nonstoloniferous group of which *Agropyron caninum* (L.) Beauv. is typical. As Malte clearly shows⁵ (pp. 28–30), true *A. caninum* of Eurasia is quite a different species from the long-awned plant of North America which has erroneously passed for it. Abundant herbarium material supports this decision, so that the primary premises of Pease & Moore's revision, that our plant is *A. caninum* and that such very different plants as *A. latiglume* (Scribn. & Sm.)

¹ Scribner & Smith, U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 23–36 (1897).

² Piper, Bull. Torr. Bot. Cl. xxxii. 543–547 (1905).

³ Pease & Moore, RHODORA, xii. 61–77 (1910).

⁴ Malte, Nat. Mus. Can. Ann. Rep. for 1930, 27–48, plates 1–5 (1932).

⁵ Earlier students, Beal and others, had doubted the occurrence of *A. caninum* in America; and in 1900 Scribner (in Brainerd, Jones & Eggleston, Fl. Vt. 9) implied that we do not have it.

Rydb. and *A. tenerum* Vasey are merely variations of it, lose much of their force. The North American counterpart of the Eurasian *A. caninum*, the plant (PLATE 244, FIGS. 1-4, and MAP 18) with long awns, occurring generally from Newfoundland and eastern Canada to New England and Pennsylvania, thence across the continent, is *Triticum subsecundum* Link (1833), the type of which is illustrated by Malte (his plate v), while its very large extreme (our PLATE 244, FIGS. 5-7 and MAP 19), with glumes, lemmas and often the awns longer, is *A. Richardsoni* Schrad. (1838) or *A. unilaterale* Cassidy (1890), not *A. unilaterale* Beauv. (1812). Scribner & Smith, Hitchcock (in Gray's Manual) and Rydberg all maintain the two latter (*A. "caninum"* and *A. Richardsoni*) as distinct species; Pease & Moore as different varieties; and Malte treats them as strictly identical!

Agropyron Richardsoni and the so-called *A. caninum* of North America sometimes overlap in their characters, but the former has a distinctive disruption of geographic range which suggests that it is not merely a selected series of overgrown individuals. Whereas *A. "caninum"* (MAP 18) is a common or frequent plant of either calcareous or non-calcareous ledgy and gravelly shores and dry woods and thickets from eastern Newfoundland to Pennsylvania, thence westward to the Pacific, the coarse *A. Richardsoni* (MAP 19) is decidedly localized east of the Great Lakes: confined to the St. Lawrence system eastward to Gaspé and Anticosti, chiefly in calcareous soils. Therefore, *A. Richardsoni*, with a distinctive geographic range and in its typical development with clearly recognizable morphological characters, is, it seems to me, at least a good geographic variety.

Malte, agreeing in principle with Pease & Moore, treats *Agropyron tenerum* Vasey (PLATE 243, FIGS. 1-3), including both *A. pseudorepens* Scribn. & Sm. (PLATE 243, FIGS. 4-6) and *A. novae-angliae* Scribn. (PLATE 243, FIGS. 7-9), and North American *A. "caninum"* (PLATE 244, FIGS. 1-4) including *A. Richardsoni* (PLATE 244, FIGS. 5-7) as one polymorphic species; but, having demonstrated that the North American plant is not the Eurasian *A. caninum*, he correctly takes up for the aggregate-species of North America the next available name, *A. trachycaulum* (Link) Malte (1932), based on *Triticum trachycaulum* Link, apparently overlooking the fact, however, that the same combination under *Agropyron* was made by Steudel in 1854 and was repeated by Candargy in 1901.

The type of *Agropyron trachycaulum*, illustrated by Malte, is exactly *A. tenerum* Vasey (1885), but, again agreeing with Pease & Moore,

Malte merges with it two plants, *A. pseudorepens* Scribn. & Sm. and *A. novae-angliae* Scribn., which in eastern America are much more widely dispersed than typical *A. trachycaulum*. True *A. trachycaulum* or *A. tenerum* (PLATE 243, FIGS. 1-3 and MAP 15) (also *Triticum pauciflorum* Schwein. (1824)) has very slender and elongate spikes, with the tightly appressed spikelets scarcely imbricated, the tips of most of them failing to reach the spikelet next above (on the same side); many of the internodes of the rachis strongly quadrate, with all four sides deeply concaved, the middle internodes mostly 0.8-2 cm. long; glumes coriaceous or subcoriaceous, with hyaline border 0.4-0.6 mm. broad and the closely embraced rachillas (PLATE 243, FIG. 3) usually only scabrous or appressed-pubescent. This plant, true *A. trachycaulum* or *A. tenerum*, is widely dispersed in western North America, from southern Alaska to California, thence eastward to the more western of the Great Lakes; east of Minnesota and adjacent Ontario and Wisconsin it is represented in the extensive eastern collections in the Gray Herbarium only from limestone cliffs, slopes and gravels near the Gulf of St. Lawrence in eastern Quebec: Anticosti and the Mingan Islands, the Gaspé Peninsula and Bic.

The other plants merged, without any indication of doubt by Pease & Moore (except that they separated the shorter-spiked specimens of *A. pseudorepens* as *A. caninum*, var. *Hornemanni*) and, again, by Malte, with true *A. trachycaulum* (*A. tenerum*) usually have dense spikes of well-imbricated and less closely appressed spikelets; the internodes of the rachis usually not strongly quadrate but with convex or corrugated backs and commonly 2 (instead of 4) ciliate edges; the middle internodes short; the glumes inclined to be more herbaceous and narrowly margined (hyaline margins only 0.1-0.4 mm. broad); the free rachillas commonly villous (with loosely spreading pubescence). These plants with denser spikes appear in two well marked geographic trends. The first of these (PLATE 243, FIGS. 4-6 and MAP 16) is prevailingly calcicolous, occurring very generally from southern Labrador and the lower St. Lawrence to southern Maine on limy soils or on the margins of the sea or in brackish or saline marshes. Inland it is more inclined to take to the upland, occurring (as *A. caninum*, var. *Hornemanni* Pease & Moore) in the subalpine and alpine (not always calcareous) regions of Maine and New Hampshire. It next appears on the north shore of Lake Superior and extends thence across the calcareous plains westward, where it is known as

A. pseudorepens. This plant has comparatively dense spikes, in maturity (in fruit) averaging 7 mm. in diameter, in anthesis much thicker, and with glumes averaging 12.5 mm. long. As stated, the shorter-spiked members of this series were called by Pease & Moore *A. caninum*, var. *Hornemanni* and many botanists have identified them with *A. violaceum* (Hornem.) Lange, based upon *Triticum violaceum* Hornem. Malte clearly shows, however, that the name *Triticum violaceum* was a *nomen confusum* which should be rejected, while *T. biflorum*, β . *Hornemanni* Koch, involved in the typification of *A. caninum*, var. *Hornemanni*, was, by description, *A. latiglume* (Scribn. & Sm.) Rydb., an arctic species with unkeeled and broad-margined broadly oblong to narrowly obovate glumes and pubescent lemmas, which is unknown in eastern North America south of northern Labrador.

The other dense-spiked plant with villous rachillas, merged by Pease & Moore and now by Malte with typical *Agropyron trachycaulum* (*A. tenerum*), is *A. novae-angliae* (PLATE 243, FIGS. 7-9 and MAP 17), characterized by its slender spike (in maturity averaging only 5 (3-6) mm. in diameter), with the glumes averaging 8 (5-10) mm. long and the lemmas proportionally small. *A. novae-angliae* passes into *A. pseudorepens*, which in turn merges into *A. trachycaulum*, but in its typical form *A. novae-angliae* in the East is a plant of low altitudes and usually on neutral to acid soils (either rock, gravel or wet peat) from northern Labrador to the granitic hills of southern New England, thence westward. In general, then, while typical *A. trachycaulum* in eastern America is confined to the limestones bordering the Gulf of St. Lawrence in Quebec, *A. pseudorepens*, also chiefly calcicolous, has a wider eastern range, from southern Labrador to southern Maine and northern New Hampshire; and *A. novae-angliae*, chiefly of neutral or acid soils, extends into the cooler parts of southern New England.

Although very different in their extremes, all these plants seem to pass, as Pease & Moore and, later, Malte have independently maintained, into one another.¹ In their best developments, however, they all have rather distinct geographic ranges, at least in eastern America; and I find myself looking upon them as reasonably defined geographic

¹ The late Charles Walter Swan, an unassuming but wonderfully close student of New England grasses, left many suggestive notes on specimens he studied. On one of *A. trachycaulum*, var. *glaucum* ("A. caninum"), collected at Willoughby in 1898, he wrote: "Cut off the awns and compare. Why, 'violaceum' [*i. e. novae-angliae*]."

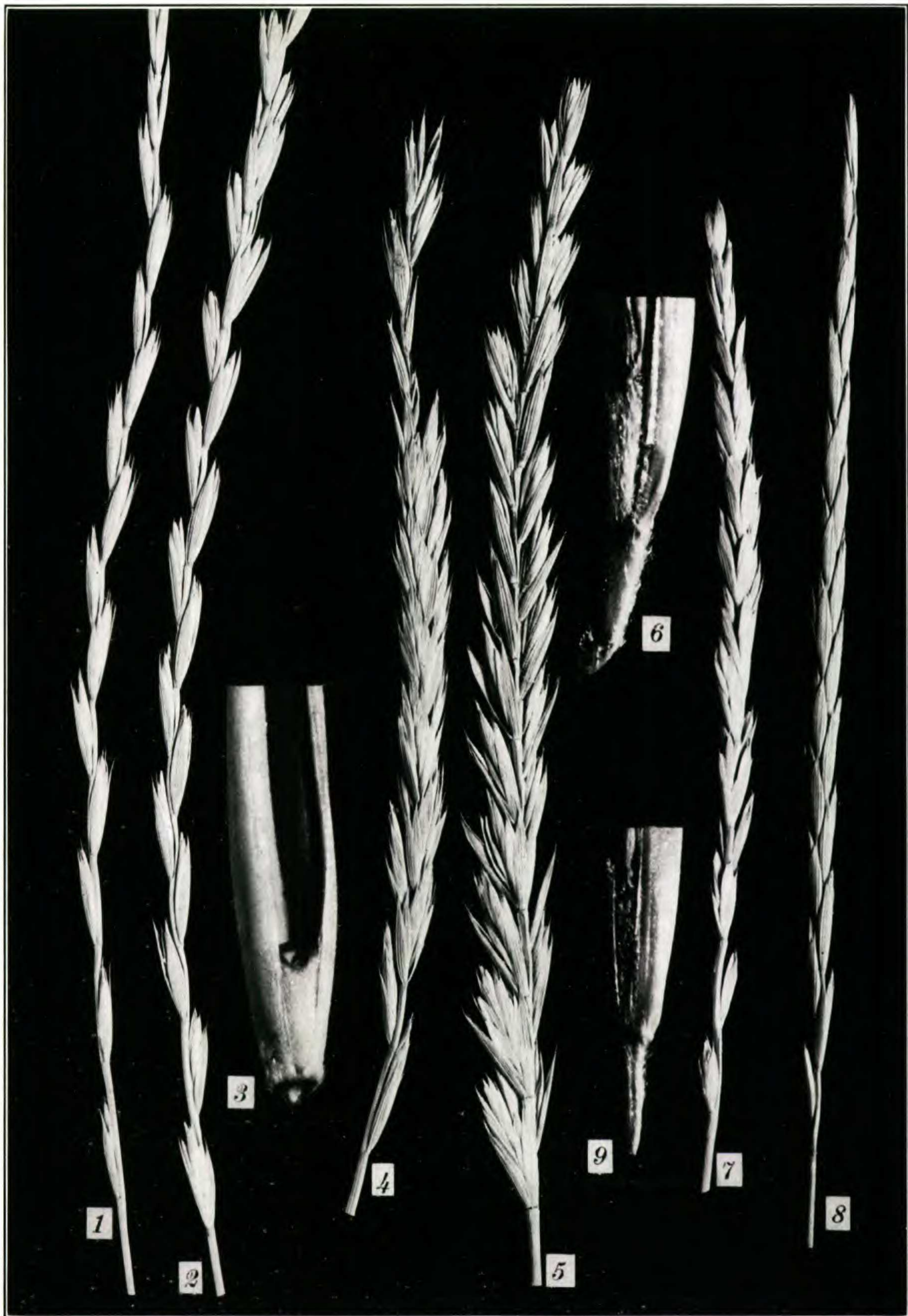
varieties. It does not seem satisfactory to submerge as identical with *A. trachycaulum* (*A. tenerum*) such pronounced variations as *A. pseudorepens* and *A. novae-angliae*; nor does it seem any more satisfactory to treat as strictly identical *A. Richardsoni* (*A. unilaterale*) and the smaller "*A. caninum*."

All or nearly all of our varieties of *Agropyron trachycaulum* may have green or more or less glaucous or glabrous or more or less pubescent phases. These usually occur without appreciable geographic segregation (often in closely adjacent colonies), and long experience in the field has abundantly demonstrated that such variations may be expected throughout the ranges of any of the major or primary varieties. Pease & Moore, following what seems the more logical method in such cases, treated them as *formae*, this being the procedure which for several years the more progressive systematists have been adopting. Thus, the late Otto Holmberg, whose regrettable death has left unfinished the most scholarly of Scandinavian floras, treated such minor tendencies as forms, reserving the varietal category for stronger variations, with notable differences in size of parts or with morphological differences and somewhat definite ranges: *Festuca ovina*, f. *hispidula* and f. *laeviflora*, but var. *vivipara* and var. *duriuscula*; *F. rubra*, f. *glaucescens* and f. *planifolia*, but var. *commutata* and var. *oelandica*; *Agropyron repens*, f. *pubescens*, but var. *maritimum*; etc. In general, I have for some years been trying to follow this procedure and so have Blake, Eames, Weatherby and others in America. Malte, discussing such variations, concludes that "all variations of the same nature ought to be considered as equals, i. e. ought to be conceded equal taxonomic rank and value." As pure logic, wholly dissociated from the actual vagaries of Nature, this may be conceded; but, surely, when applied in classification, the logic often fails; characters which in one group are of great taxonomic importance in another may prove wholly unimportant and to be a series of nonconcomitant and unresolvable variables.

In the present case I find myself unable to follow my friend, Malte, in treating selected plants with "at least" a trace of pubescence on the old shrivelled basal sheaths, persisting from last year's new vegetative shoot, as true varieties on a par with variations so strong that they are often considered good species: such phases of the long-awned plants as his *Agropyron trachycaulum*, vars. *ciliatum* and *glaucum* or of the awnless plants as his vars. *trichocoleum* and *Fernaldii*. Nor can I

treat as coordinate with the true geographic varieties (which Scribner & Smith, Piper, Hitchcock and Rydberg have treated as full species) the more or less glaucous individuals (Malte's *A. trachycaulum*, vars. *glaucescens*, *Fernaldii*, *caerulescens* and *glaucum*), minor tendencies which differ from the green individuals only in having more wax on the surface. By drying these over heat or by immersing them in hot water *A. trachycaulum*, var. *glaucescens* becomes the green plant (*A. violaceum*, var. *majus* Vasey); var. *Fernaldii* becomes the green var. *trichocoleum* and vars. *caerulescens* and *glaucum* promptly become their greener counterparts.

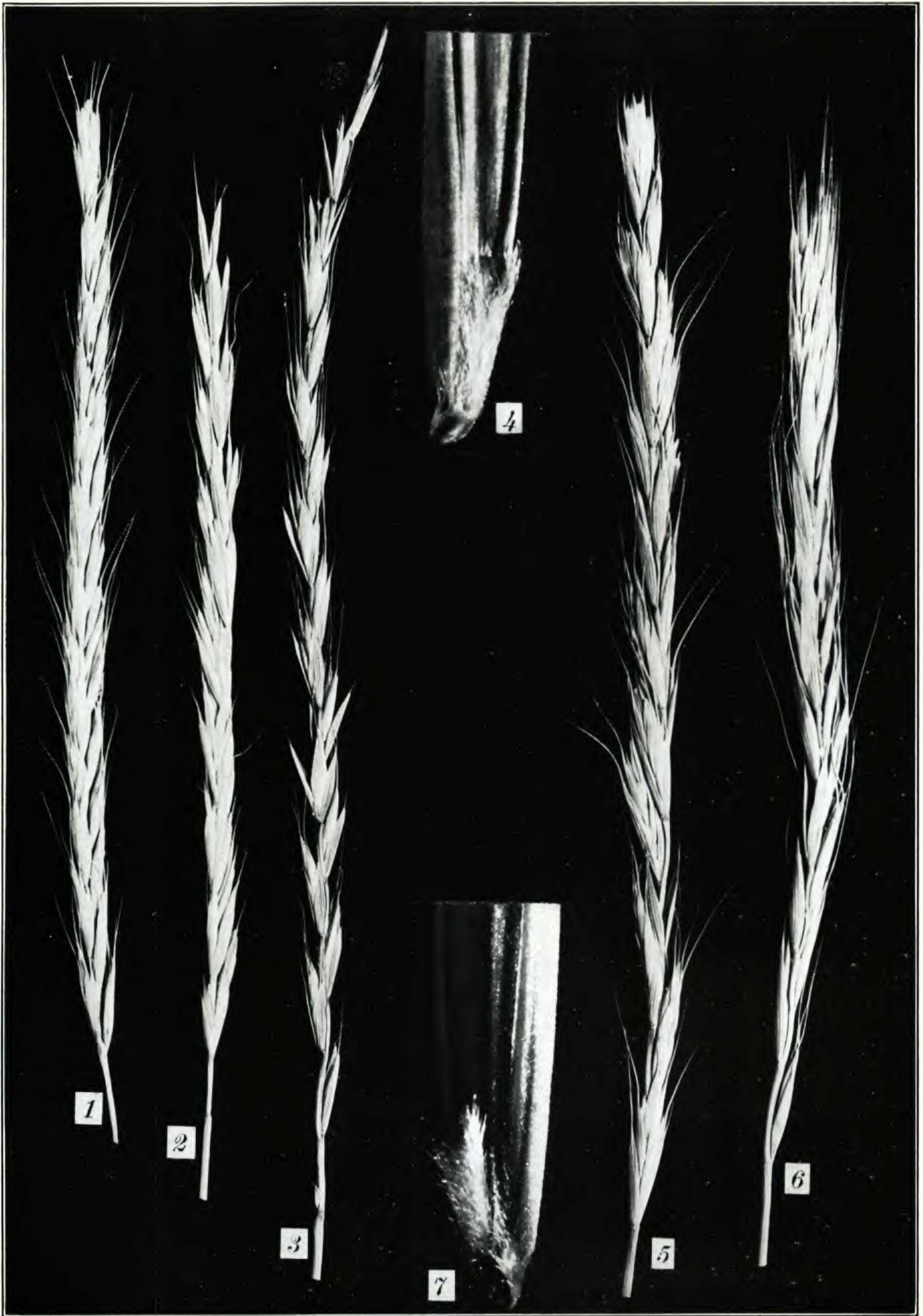
As a matter of fact, furthermore, authentic specimens of two of these so-called "varieties" from the same locality are so nearly indistinguishable that only by the closest examination can one detect that they may possibly have been collected from different clumps. *Agropyron trachycaulum*, var. *Fernaldii* (Pease & Moore) Malte, based on *A. caninum*, var. *tenerum*, f. *Fernaldii* Pease & Moore, is a slightly glaucous phase with "At least the lowest sheaths pubescent." Its designated type was collected by *John Macoun*, no. 68,978, at Cap à l'Aigle on "August 8," 1905 (in Gray Herb.) and as identical with it Pease & Moore cited another collection in the Gray Herbarium from Cap à l'Aigle, "*J. Macoun* . . . no. 68979," with the date (on the label) also "Aug. 8th, 1905." Unfortunately, Pease & Moore made a slight but confusing error, for Macoun's no. 68,978 (their type) has the date on the label (in Macoun's hand) "Aug. 24th," instead of "August 8," as cited by them. The two sheets look like young material (no. 68,979, labelled "Aug. 8th") and over-ripe material from the same colony (no. 68,978, labelled "Aug. 24th") and the transposition of the date would be of little consequence had not Malte included no. 68,979 as one of the three known collections of his new *A. trachycaulum*, var. *glaucescens* which is distinguished from his var. *Fernaldii* only by having "Sheaths glabrous." The type of var. *Fernaldii* (no. 68,978) has all the cauline leaves and sheaths quite glabrous but, when diligently searched for, two or three of the marcescent old sheaths at the base of the plant, but by no means all, show some pilosity. The younger material (no. 68,979) from the same locality, which Malte puts into a second of his varieties because it has "Sheaths glabrous," shows, likewise, in the material sent by Macoun to the Gray Herbarium, very definite pubescence upon some of the new basal offshoots. The treatment of such trivial individual divergencies (in these cases



AGROPYRON TRACHYCAULUM: FIG. 1, inflorescence, $\times 1$, from TYPE collection of *A. tenerum*; FIG. 2, inflorescence, $\times 1$, from Quebec; FIG. 3, internode of rachilla, closely embraced by lemma, $\times 10$.

VAR. MAJUS: FIG. 4, mature (closed) inflorescence, $\times 1$, from TOPOTYPE of *A. pseudorepens*; FIG. 5, young inflorescence, $\times 1$, from Newfoundland; FIG. 6, internodes of rachilla, $\times 10$.

VAR. NOVAE-ANGLIAE: FIG. 7, young inflorescence, $\times 1$, from type-region, Willoughby, Vermont; FIG. 8, ripe inflorescence, $\times 1$, from Massachusetts; FIG. 9, internodes of rachilla, $\times 10$.



AGROPYRON TRACHYCAULUM, VAR. GLAUCUM: FIG. 1, inflorescence, $\times 1$, from the TYPE; FIG. 2, inflorescence, $\times 1$, from TYPE of var. *caerulescens*; FIG. 3, inflorescence, $\times 1$, from TYPE of var. *pilosiglume*; FIG. 4, internode of rachilla and base of lemma, $\times 10$.

VAR. UNILATERALE: FIG. 5, inflorescence, $\times 1$, from Anticosti; FIG. 6, inflorescence, $\times 1$, from Montana; FIG. 7, internode of rachilla and base of lemma, $\times 10$.

with lack of apparent divergence) as true varieties does not seem wise, and their recognition as anything but visible but taxonomically unimportant departures from a theoretical type does not seem worth while. At any rate, such slight ecological or physiological responses are not comparable with the varieties which show strong departures in characters of the spikelets, in habitats and in ranges, departures so pronounced that several agrostologists have considered them true species.

In § *Holopyron*, represented in eastern America by species with elongate rootstocks, there is less difference of opinion. All recent authors are agreed as to the distinctness of *Agropyron dasystachyum* (Hook.) Vasey, *A. Smithii* Rydberg, *A. repens* (L.) Beauv. and the American representative of *A. pungens* (Pers.) R. & S (PLATE 245, FIG. 5). In recent years *A. pungens* has been called by some European botanists some kind of hybrid: by Ascherson & Graebner *Triticum junceum* × *repens*; by Rouy *A. junceum* × *littoreum*; by Holmberg *A. litorale* × *repens*. Now, a species (PLATE 245, FIG. 5), thoroughly consistent in all its characters and clearly matching European *A. pungens*, is indigenous at the sea-margin, on shingly beaches, sand dunes and borders of salt marshes, from Cape Breton to Cape Cod, the plant described from the Maine coast as *A. tetrastachys* Scribn. & Sm. It is a thoroughly typical element in the flora of this district, along with *Puccinellia maritima* (Huds.) Parl., *Festuca rubra*, var. *juncea* (Hackel) Richter, *Carex maritima* O. F. Mueller, *Polygonum Raii* Bab., *Suaeda maritima* (L.) Dumort., *Lathyrus japonicus* Willd., vars., and other maritime species which share the European and the American shores of the North Atlantic. Yet neither *Agropyron junceum*, *A. littoreum* nor *A. litorale* is known on the coast of northeastern America. Under the circumstances, with *A. pungens* a constant member of our maritime flora, it seems inevitable that it should be maintained as a true species.

Without overloading the present paper with needlessly detailed descriptions, the leading diagnostic characters of the eastern American species of *Agropyron* of both sections, as I now interpret them, may be briefly summarized in the synoptic key which follows. Since there has been much confusion in the group (especially in § *Goularda*), sufficient specimens in that section (preferably of numbered exsiccatae which will be mostly represented in numerous herbaria) are cited to render my interpretation perhaps intelligible to others. The spikes of

characteristic specimens of the different species and varieties in § *Goularda* are shown, life-size, in PLATES 243 and 244.

For the loan of several types of Vasey and of Scribner & Smith I am indebted to the great kindness of Professor A. S. Hitchcock; for the loan of the type of *Triticum pauciflorum* Schwein. to Dr. Francis W. Pennell; and for material possibly representative of Cassidy's views to Professor Ernest C. Smith.

KEY TO THE SPECIES OF AGROPYRON IN EASTERN NORTH AMERICA

- a. Spikelets not strongly flattened, at maturity readily disintegrating, the individual florets promptly disarticulating, leaving the persistent glumes: inner face of fruit flattish or broadly concaved: culms solitary or loosely to densely cespitose, without elongate rootstocks. § GOULARDA (Husnot) Holmb. Skand. Fl. pt. 2: 269 (1926) b.
- b. Anthers 1–2.5 mm. long, at most $\frac{1}{3}$ as long as the lemmas: lemmas awnless or with essentially straight and ascending awns c.
- c. Glumes flat or slightly convex, scarcely keeled, herbaceous or submembranaceous, oblong to narrowly obovate, with hyaline margin 0.5–1 mm. broad: lemmas pubescent: spike 3–13 cm. long: plant arctic or subarctic with us
1. *A. latiglume*.
- c. Glumes keeled, subcoriaceous to herbaceous, linear-lanceolate to elliptic, with hyaline margin 0.1–0.6 mm. broad: lemmas glabrous (rarely scabrous): spikes 0.4–2.5 dm. long: plants of temperate regions 2. *A. trachycaulum*.
- b. Anthers 3 mm. long: lemmas with strongly arched-divergent long awns 3. *A. spicatum*.
- a. Spikelets strongly flattened or 4-sided, at maturity dropping intact from the rachis, the individual florets not readily detached: anthers at least $\frac{1}{2}$ as long as the lemmas, 3–6 mm. long: inner face of fruit deeply channeled: culms solitary or tufted: rootstocks very elongate and extensively creeping. § HOLOPYRON Holmb. l. c. 273 (1926) d.
- d. Lemmas and rachillas densely villous to lanate 4. *A. dasystachyum*.
- d. Lemmas and rachillas glabrous to scabrous e.
- e. Glumes linear-attenuate, tapering with straight margins from below the middle: spikelets 7–13-flowered: cartilaginous band of upper nodes of culm shorter than thick 5. *A. Smithii*.
- e. Glumes lanceolate to oblong, gradually curving to tip from above the middle: spikelets 3–7 (in the maritime no. 6, –11)-flowered: cartilaginous band of upper nodes of culm as long as thick.
Spike nearly square in section: internodes of rachis thick, usually 4-angled: spikelets 7–11 (very rarely only 3–5)-flowered: glumes coriaceous, with broadly rounded keel and ribs: leaves hard, very glaucous, mostly involute, with remote coarse ribs: top of culm solid (closely filled with pith) 6. *A. pungens*.
Spike usually not conspicuously quadrate: internodes of rachis thin, rounded on the back, 2-edged: spikelets 2–7-flowered: glumes herbaceous, with slender keel and ribs: leaves soft, flat, with crowded fine nerves: top of culm hollow 7. *A. repens*.

1. *A. LATIGLUME* (Scribn. & Sm.) Rydberg, Bull. Torr. Bot. Cl. xxxvi. 539 (1909). *A. violaceum latiglume* Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 30 (1897). *A. biflorum latiglume* (Scribn. & Sm.) Piper, Bull. Torr. Bot. Cl. xxxii. 547 (1905). *A. caninum*, var. *latiglume* (Scribn. & Sm.) Pease & Moore, RHODORA, xii. 73 (1910).—An arctic species, extending south in eastern America only to LABRADOR: Rama, August 20–24, 1897, *Sornborger*, no. 263, as *A. violaceum*.

Agropyron latiglume belongs to an arctic and subarctic series, including the American *A. alaskanum* Scribn. & Merr. and *A. yukonis* Scribn. & Merr. and the Old World *A. mutabile* Drobov. The material from continental boreal America is as yet too scanty to make out the true status of all these reputed species.

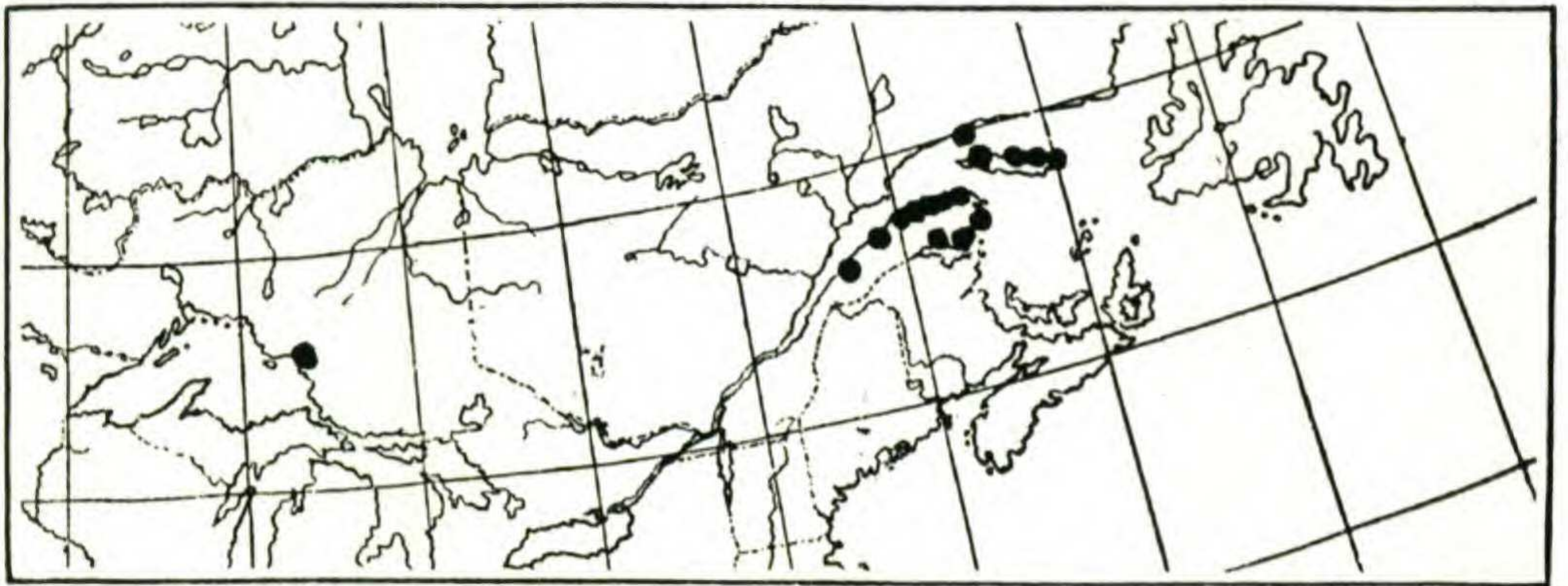
2. *A. TRACHYCAULUM* (Link) Steud.—A highly variable North American species, represented in eastern America by the following five geographic varieties.

- a. Awns wanting or very short, at most $\frac{1}{2}$ as long as body of lemma. . . . b.
- b. Glumes coriaceous or subcoriaceous, with hyaline margins 0.4–0.6 mm. broad: spikelets in ours scarcely imbricated, the tips rarely reaching the bases of those above (on the same side): internodes of rachis often strongly quadrate, with all 4 sides concave and winged, mostly 0.8–2 cm. long; the 2nd internode 0.8–1.5 mm. broad, 0.5–1.3 mm. thick: rachilla usually scabrous or strigose, tightly embraced. . . . Var. *typicum*.
- b. Glumes herbaceous to subcoriaceous, the hyaline margin only 0.1–0.4 mm. broad: all or all but the lowest spikelets well imbricated: internodes of rachis shorter, mostly convex or merely corrugated on the back and with 2 narrow edges; the 2nd internode 0.3–0.8 mm. thick: rachilla usually villous, with spreading pubescence, free.
Glumes (excluding awns, when present) averaging 12.5 (10–16) mm. long: contracted fruiting spike averaging 7 (5–12) mm. thick. . . . Var. *majus*.
Glumes (excluding awns, when present) averaging 8 (7–10) mm. long: contracted fruiting spike averaging 5 (3–6) mm. thick. . . . Var. *novae-angliae*.
- a. Awns nearly equaling to much longer than body of lemma.
Glumes averaging 9 (6–12) mm. long: awns of lemmas 7–20 mm. long: contracted fruiting spike (excluding awns) averaging 5 (3–10) mm. thick. . . . Var. *glaucum*.
Glumes averaging 13.5 (12–18) mm. long: awns of lemmas 10–40 mm. long: contracted fruiting spike (excluding awns) averaging 9 (6–13) mm. thick. . . . Var. *unilaterale*.

Var. **typicum**. *Triticum trachycaulum* Link, Hort. Bot. Berol. ii. 189 (1833). *T. pauciflorum* Schwein. in Keating's Narr. Long's 2d Exped. ii. 383 (1824), not *A. pauciflorum* Schur (1859). *A. trachycaulum* (Link) Steud. Syn. Pl. Gram. i. 344 (1854);¹ Candargy, Étude Mon. Tribu Hord. 43 (1901), combination erroneously ascribed to

¹ For date of issue see Rendle, Journ. Bot. xxxvii. 33, 34 (1899).

“Host” (doubtless a misprint for “Hort”); Malte, Ann. Rep. 1930, Nat. Mus. Can. 42 (1932). *Crithopyrum trachycaulum* (Link) Steud. l. c. (1854). *A. tenerum* Vasey, Bot. Gaz. x. 258 (1885). *A. repens*, var. *tenerum* (Vasey) Beal, Grasses N. Am. ii. 637 (1896). *A. tenerum longifolium* Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 30 (1897). *A. pseudorepens magnum* Scribn. & Sm. l. c. 34 (1897), extremely large spikelets. *A. tenerum magnum* (Scribn. & Sm.) Piper, Bull. Torr. Bot. Cl. xxxii. 546 (1905). *A. caninum*, var. *tenerum* (Vasey) Pease & Moore, RHODORA, xii. 71 (1910). *Zeia tenera* (Vasey) Lunell, Am. Midl. Nat. iv. 227 (1915). *A. trachycaulum*, var. *tenerum* (Vasey) Malte, l. c. 44 (1932). PLATE 243, FIGS. 1-3, and MAP 15.—Western North America, from southern Alaska to California, eastward to western Ontario, Wisconsin (perhaps introduced), Iowa and Missouri (introduced); limestone soils about the Gulf of St. Lawrence, Quebec. The following selected specimens



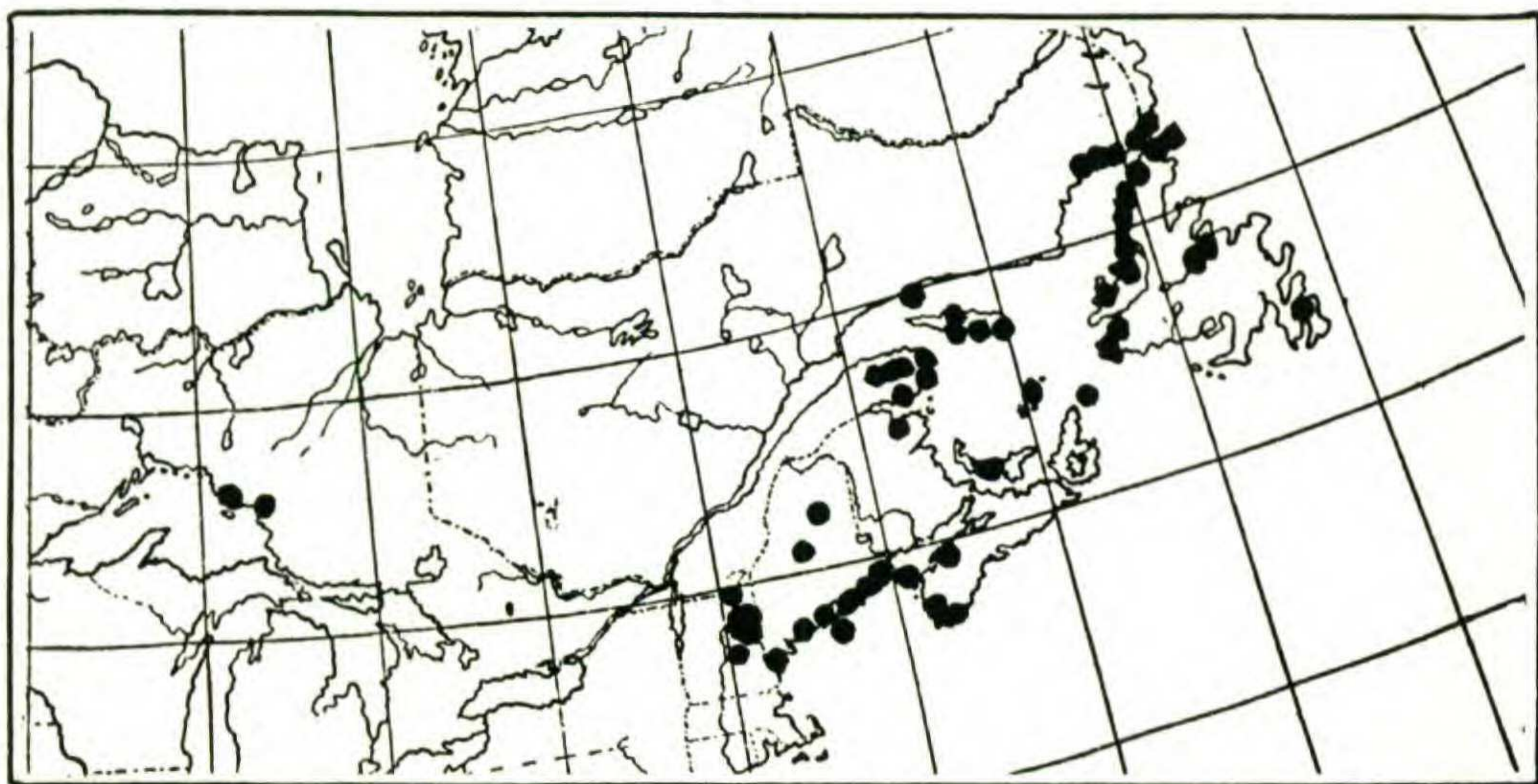
Map 15. Eastern Range of *AGROPYRON TRACHYCAULUM*, var. *TYPICUM*.

(chiefly eastern) are typical. QUEBEC: sur les rivages calcaires, Grande Ile, Archipel de Mingan, *Victorin & Rolland*, no. 20,555; sur les platières calcaires, Riv. au Saumon, Anticosti, *Victorin, Rolland & Louis-Marie*, no. 20,556; sur les alluvions près de l'embouchure de la rivière, Baie du Nord, Anticosti, *Victorin, Rolland & Louis-Marie*, no. 20,588; sur les éboulis dans les gorges, R. Vaureal, Anticosti, *Victorin & Rolland*, no. 27,889; sur les bords de la petite rivière, Pointe de l'Est, Anticosti, *Victorin & Rolland*, no. 27,893; rivages calcaires, R. du Renard, Anticosti, *Victorin & Rolland*, no. 27,894; limestone-conglomerate talus, Mt. Ste. Anne, Percé, *Collins & Fernald*, no. 36; calcareous sea-cliffs between Mont Louis and R. à Pierre, *Fernald & Smith*, no. 25,465; Mt. St. Pierre, *Victorin, Rolland & Jacques*, no. 33,199; dry calcareous slaty talus of Mt. St. Pierre, *Fernald, Weatherby & Stebbins*, no. 2423; cobbly beach of Gulf of St. Lawrence, Cap au Renard, *Fernald & Pease*, no. 24,909; shore of St. Lawrence, Matane, August 3, 1909, *F. F. Forbes*; gravelly beach at Paspébiac Lighthouse, July 26, 1902, *Williams & Fernald*; gravelly beach, Tracadigash Point, Carleton, July 22, 1904, *Collins & Fernald*;

limestone-conglomerate cliffs and ledges, Cap au Massacre, Bic, July 16, 1904, *Collins & Fernald*. ONTARIO: sands at Pic R., July 30, 1869, *J. Macoun*, no. 175. WISCONSIN: Murphy's Railroad track, Green Bay, July 15, 1897, *Schuette*. MANITOBA: Emerson, July 17, 1887, *J. Fowler*. MINNESOTA: Garden Island, Lake of the Woods, *MacMillan & Sheldon*, no. 1353; Fort Snelling, *Mearns*, no. 780; Bridgeman, July, 1892, *Sheldon*; prairies, common, Montevideo, June 19, 1896, *Moyer*; Elmore, *Pammel*, no. 895; "Prairies of the St. Peter" [Minnesota R.], *Say*, 1823 (type of *Triticum pauciflorum* Schwein., in herb. Phil. Acad.). IOWA: Wheatland, *Ball*, no. 271; Ames, June 27, 1893, *F. C. Stewart*; Little Rock, *Ball*, no. 556. MISSOURI: rare, introduced along railroads, Sheffield, July 17, 1898, *Mackenzie*, no. 246, July 10, 1899, *Bush*, no. 142. COLORADO: Fort Garland, 1884, *Vasey* (type no. of *A. tenerum* Vasey, as designated by Piper, Bull. Torr. Bot. Cl. xxxii. 543 (1905))—form with very slender spike; near Empire, *Rydberg*, no. 2401 (type of *A. pseudorepens magnum* Scribn. & Sm., consequently of *A. tenerum magnum* (Scribn. & Sm.) Piper; in U. S. Nat. Herb.)—form with unusually stout spike. OREGON: along spring-runs in open places, near Grant's Pass, *Howell*, no. 256 (type of *A. tenerum longifolium* Scribn. & Sm., in U. S. Nat. Herb.).

Var. **majus** (Vasey), comb. nov. ?*A. violaceum*, β . *virescens* Lange, Consp. Fl. Groenl. 155 (1880). *A. violaceum*, var. *majus* Vasey, Contr. U. S. Nat. Herb. i. 280 (1893). *A. pseudorepens* Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 34 (1897). *A. tenerum majus* Vasey ex Piper, Bull. Torr. Bot. Cl. xxxii. 543 (1905). *A. caninum*, var. *Hornemanni* Pease & Moore, RHODORA, xii. 73 (1910) in large part, but not as to name-bringing synonym, *Triticum biflorum* β . *Hornemanni* Koch, acc. to Malte, l. c. 38 (1932). *A. tenerum*, var. *pseudorepens* (Scribn. & Sm.) M. E. Jones, Contr. West. Bot. xiv. 19 (1912). *Zeia pseudorepens* (Scribn. & Sm.) Lunell, Am. Midl. Nat. iv. 226 (1915). PLATE 243, FIGS. 4–6, and MAP 16.—Chiefly in calcareous or subalkaline soils, southern Labrador (and ?Greenland) to southern British Columbia, south to coast of Maine, northern New Hampshire, Lake Superior (Ontario) Nebraska, Colorado, Nevada and Oregon. The following, selected from a large representation, are typical. LABRADOR: rocks, Forteau, *Fernald & Wiegand*, no. 2690. NEWFOUNDLAND: edge of salt marsh, Killigrew's, *Fernald & Wiegand*, no. 4691; dry cliffs and talus, Tilt Cove, *Fernald & Wiegand*, no. 4690; ledges, talus and gravel by Exploits R., Bishop Falls, *Fernald & Wiegand*, no. 4687; ledges, etc., Exploits R., Grand Falls, *Fernald & Wiegand*, no. 4686; gravelly and turfy strand near Isthmus Cove, Pistolet Bay, *Wiegand, Gilbert & Hotchkiss*, no. 27,435; turfy limestone barrens, Cape Norman, *Wiegand & Long*, no. 27,438; wet spruce, thicket, Flower Cove, *Fernald, Long & Dunbar*, no. 26,323; limestone ledges and gravel, St. Barbe, *Fernald, Long & Dunbar*, no. 26,324; turfy limestone shore, Plum Point, Brig Bay, *Fernald, Long*

& Dunbar, no. 26,325 (approaching var. *unilaterale*); peaty limestone barrens, St. John Isl., *Fernald et al.*, no. 27,436; turfy and gravelly shore, Back (or Bustard) Cove, *Fernald, Long & Fogg*, no. 1282; turfy terraces and slopes, Pointe Riche, *Fernald, Long & Fogg*, no. 1281; wet runs and boggy spots, Ingornachoix Bay, *Fernald & Wiegand*, no. 2680; damp shores, Port Saunders, *Fernald & Wiegand*, no. 2687; serpentine tablelands, alt. 380 m., Bonne Bay, *Fernald & Wiegand*, no. 2684; inside the strand, Southeast Arm, Bonne Bay, *Fernald & Wiegand*, no. 2693; shelves and talus of diorite, Western Head, Bonne Bay, *Fernald, Long & Fogg*, no. 1283; dry sandy soil near sea-level, Bay of Islands, *Eames & Godfrey*, no. 5878; sea beach, Little River, *Mackenzie & Griscom*, no. 11,178. QUEBEC: limestone terraces, Blanc Sablon ("Labrador"), *Fernald & Wiegand*, no. 2689; grassy hillside, R. à la Truite, Brest, *St. John*, no. 90,169; sandy isle



Map 16. Eastern Range of *AGROPYRON TRACHYCAULUM*, var. *MAJUS*.

in R. St. Augustin, *St. John*, no. 90,168; grassy shore, Pointe au Maurier, Charnay, *St. John*, no. 90,170; grève de cailloutis calcaire, Lac Salé, Anticosti, *Victorin & Rolland*, no. 24,772; cailloutis calcaire, R. la Loutre, Anticosti, *Victorin & Rolland*, no. 24,773 (transition to var. *unilaterale*); sur les platières, R. Chicotte, Anticosti, *Victorin & Rolland*, nos. 27,890, 27,892; platières calcaires, R. MacDonald, Anticosti, *Victorin, Rolland & Louis-Marie*, nos. 20,553, 20,557, 20,559; falaises de la Montagne Saint-Alban, Cap Rosier, *Victorin et al.*, no. 17,834; calcareous walls of Grande Coupe, Percé, *Fernald & Collins*, no. 917, *Victorin et al.*, no. 17,833; calcareous alpine meadow, alt. 1000–1125 m., Table-topped Mt., *Fernald & Collins*, nos. 368, 372; subalpine meadows (alt. 1200 m.), Mt. Au Clair, Tabletop Mts., *Fernald & Smith*, no. 25,467; boggy spots at 1000 m., tableland of Mt. Albert, *Fernald & Collins*, no. 35; crevices and talus of serpentine, Lac au Diable, Mt. Albert, *Fernald & Collins*, no. 411; dans le massif de

serpentine, Ruisseau des Neiges, *Victorin et al.*, no. 17,829; dry schistose crests and talus, alt. 850–1000 m., Mt. Logan, *Pease & Smith*, no. 25,466; alluvial islands at mouth of Bonaventure R., August 4, 1904, *Collins, Fernald & Pease*; gravelly shore of St. Lawrence, Cacouna, August 8, 1902, *Fernald*; vicinity of Cap à l'Aigle, *J. Macoun*, nos. 68,978 (type of *A. caninum*, var. *tenerum*, f. *Fernaldii* Pease & Moore; consequently, of *A. trachycaulum*, var. *Fernaldii* (Pease & Moore) Malte), 68,979 (cited by Malte as var. *glaucescens* Malte); 68,981 (green state). MAGDALEN ISLANDS: sandstone bluffs, Grosse Isle, *Fernald, Long & St. John*, nos. 6937 (glaucous), 6938 (green). PRINCE EDWARD ISLAND: dry clearing, Indian River, *Fernald, Long & St. John*, no. 6943. NOVA SCOTIA: barrens, St. Paul I., *Perry & Roscoe*, no. 77; thicket bordering salt marsh, Village-dale, *Fernald, Long & Linder*, no. 20,104; rocky and gravelly beach (brackish), Eel Lake, *Fernald, Bean & White*, no. 20,101; brackish marsh, Abram R., *Fernald, Bean & White*, no. 20,103; thin open humus (on basalt), North Mt., Belle Isle, *Fernald, Bartram, Long & Fassett*, no. 23,342. NEW BRUNSWICK: brackish marsh, Bathurst, *S. F. Blake*, no. 5459; shelves of sea-cliffs (basalt), north of Whale Cove, Grand Manan, *Weatherby & Weatherby*, no. 5490. MAINE: Mt. Katahdin, August, 1892, *F. P. Briggs*; slide, West Wall, North Basin, Katahdin, July 13, 1900, *Williams, Fernald*; North Wall, North Basin, Katahdin, *S. J. Ewer*, no. 147; opening by Chimney Pond, Katahdin, *Ewer*, no. 241; Mt. Kineo, August 26, 1867, *C. E. Smith*; damp basaltic shingle, Lubec, *Fernald*, no. 1365; calcareous ledges, Kelly Point, Pembroke, *Fernald*, no. 1369; edge of salt marsh, Roque Bluffs, August 6, 1919, *Knowlton*; dry sandy shore, Machiasport, July 25, 1914, *Knowlton*; rocky shore, Matinicus, August 6, 1919, *C. A. E. Long*; rocks along shore, Ocean Point, Boothbay, *Fassett*, no. 234; salt marsh, Wells Beach, July 23, 1898, *Fernald*. NEW HAMPSHIRE: railroad track, Northumberland, *Fernald & Pease*, no. 16,715; "in alpinis Montium Alborum," *Tuckerman*; Oakes Gulf, Mt. Washington, *Faxon, Churchill, Kennedy et al.*; Alpine Garden, Mt. Washington, *Faxon, Pease*, no. 10,600; Fan of Huntington's Ravine, *Pease*, no. 13,898; outlet of Lake of the Clouds, Mt. Washington, *Robinson*, no. 979; Ethan's Pond, Mt. Willey, August, 1877, *Faxon*; summit of Mt. Willard, July 19, 1894, *Williams*; border of rich deciduous woods, North Woodstock, *Fernald*, no. 11,566. VERMONT: gravelly bank, Canaan, *Pease*, no. 10,088. ONTARIO: Pic R., Lake Superior, *Loring*; mouth of Dog R., Lake Superior, *J. Macoun*, no. 176. NORTH DAKOTA: Devil's Lake, July 16, 1902, *Lunell*. SOUTH DAKOTA: Brookings, June 29, 1897, *Thornber*. NEBRASKA: Kearney, June 20, 1895, *Rydberg*, no. 2018 (type of *A. pseudorepens* Scribn. & Sm.), *Shear*, no. 272 (topotype of *A. pseudorepens*); Merriman, July 11, 1899, *J. M. Bates*; Broken Bow, alt. 2478 ft., *Pammel*, no. 54; Ravenna, *Pammel*, no. 59; wet valley near Whitman, *Rydberg*, no. 1619. WYOMING: Wood's Landing, Albany Co., *Nelson*, no. 3965; Pelican

Creek, Yellowstone Park, *Tweedy*, no. 624. COLORADO: Walsenburg, Huerfano Co., alt. 6000 ft., *Clements*, no. 81; South Park, *E. L. Hughes*, no. 11. NEVADA: Lone Mt., alt. 8000 ft., Elko Co., *P. B. Kennedy*, no. 4357; Truckee meadows, near Sparks, *Kennedy*, no. 3059. OREGON: 1884, *Cusick*, no. 1134 (TYPE of *A. violaceum*, var. *majus* Vasey; consequently of *A. tenerum majus* Vasey; rachilla as in typical *A. trachycaulum*, but plant otherwise like the common eastern form). WASHINGTON: Pullman, *Piper*, no. 1910, in part (mixed with var. *novae-angliae*). BRITISH COLUMBIA: Cascade, *J. M. Macoun*, no. 63,388.

The sheaths, blades or spikes are more or less glaucous in the minor form or state:

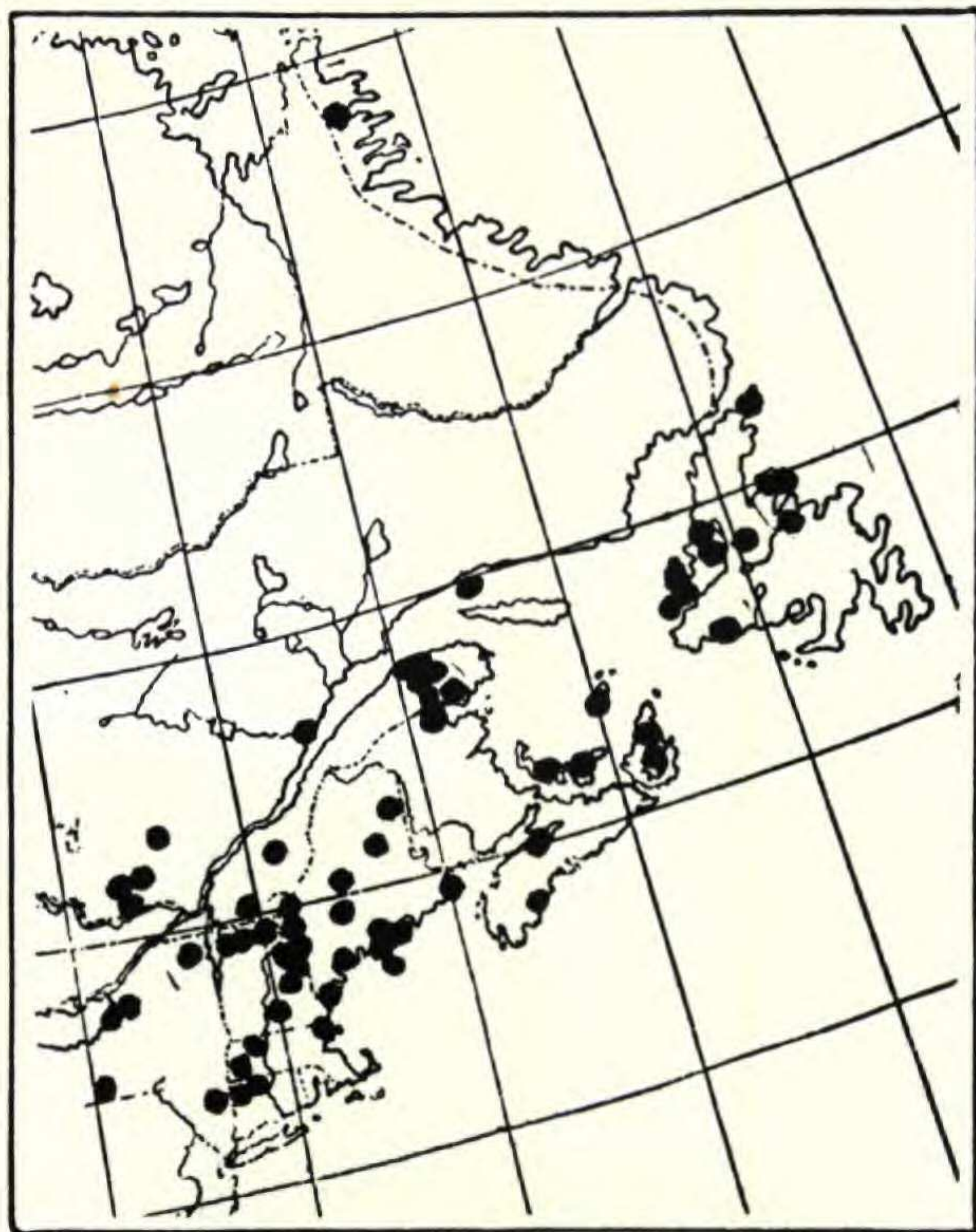
A. caninum, var. *tenerum*, f. *Fernaldii* Pease & Moore, l. c., 73 (1910). *A. trachycaulum*, var. *glaucescens* Malte in H. F. Lewis, Can. Field-Nat. xlv. 201 (1931), name only, and Ann. Rep. 1930, Nat. Mus. Can. 45 (1932). *A. trachycaulum*, var. *Fernaldii* (Pease & Moore) Malte, l. c. 46 (1932).

The varietal name *Agropyron violaceum*, β . *virescens* Lange (1880) can hardly be taken up, although it is not impossible that Lange may have had our plant. Malte shows, however (pp. 38, 39), that there was great confusion as to its exact identity and that it is now "impossible to say what particular form it was." Although the type of *A. violaceum*, var. *majus*, for the loan of which I am indebted to Professor Hitchcock, has the rachillas scabrous rather than villous, it is otherwise quite like the common eastern plant and, in view of the inconstancy of this character in western material, it does not seem justifiable to reject this earliest available varietal name. The type of *A. pseudorepens* (Rydberg, no. 2018) is exactly the common plant of the shores of western Newfoundland and eastern Canada. The topotype (*Shear*, no. 272), collected on the same day, may well have come from the colony with the type. *A. caninum*, var. *Hornemanni* Pease & Moore was based on *Triticum biflorum*, β . *Hornemanni* Koch, which, according to Malte (p. 38), is *A. latiglume*. The plant of Pease & Moore is largely a short-spiked alpine extreme of *A. trachycaulum*, var. *majus*. As to the more or less glaucous phases of the variety which have been separated by Pease & Moore and by Malte, see the discussion on p. 166.

Var. **novae-angliae** (Scribn.), comb. nov. *A. novae-angliae* Scribn. in Brainerd, Jones & Eggleston, Fl. Vt. 9 (name), 103 (1900). *A. tenerum*, var. *novae-angliae* (Scribn.) Farwell, Rep. Mich. Acad. Sci. xxi. 355 (1920). *A. repens*, var. *novae-angliae* Scribn. & Sm. acc. to Farwell l. c. (1920) in synonymy. PLATE 243, FIGS. 7-9, and MAP 17.—

Acid to calcareous rock and gravel, bogs and open woods, northern Labrador to Alberta, south to Connecticut, southern New York, Michigan, Wisconsin, Nebraska, Colorado and Nevada. The following, selected from a large representation, are characteristic. LABRADOR: on granitic rock, river-delta at head of Nachvak Bay, *Woodworth*, no. 37. NEWFOUNDLAND: gravelly and rocky seashore, Snook's Arm, *Fernald & Wiegand*, no. 4689; bogs, Bishop Falls, *Fernald & Wiegand*, no. 4688; sandy beach, Sandy Lake, *Fernald & Wiegand*, no. 2685; partially shaded limestone escarpments, Burnt Cape, *Fernald & Long*, no. 27,437; gravelly strand, Southeast Arm, Bonne Bay, *Fernald & Wiegand*, no. 2692; serpentine gravel, The Tableland, Bonne Bay, *Fernald, Long & Fogg*, no. 1285; serpentine barrens, Blomidon, *Fernald & Wiegand*, nos. 2686, 2688; sandy flats, mouth of Blomidon Brook, Frenchman's Cove, *Mackenzie & Griscom*, no. 10,103; peaty and gravelly slopes, French (or Tweed) I., *Fernald, Long & Fogg*, no. 65; wet runs and boggy spots in limestone barrens, Table Mt., Port au Port Bay, *Fernald & Wiegand*, no. 2682; meadow in limestone barrens, Green Gardens, Cape St. George, *Mackenzie & Griscom*, no. 11,011;

cobbly barrier-beach, Great Barachois (or Barasway Bay), Burgeo and La Poile, *Fernald, Long & Fogg*, no. 66; turfy sand-plain, Sand Beach, west of Burgeo, *Fernald, Long & Fogg*, no. 64. QUEBEC: boggy thicket, Ile Ste G n vieve, Mingan Ids., *St. John*, no. 90, 171; rich wooded banks, R. Ste. Anne des Monts, *Fernald & Collins*, no. 171; on hornblende schist, Mt. Albert, *Fernald & Collins*, no. 405; crevices and talus of serpentine, Ruisseau   la Neige, Mt. Albert, *Fernald & Collins*, no. 416; Coul e d'Approche, Mt. Albert, *Victorin et al.*, no. 17,828; turfy and mossy slopes, Mt. Fortin, *Fernald & Pease*, no. 24,910; gravelly beaches and flats of Bonaventure R., August 5-8, 1904, *Collins, Fernald & Pease*; gravel beaches and bars, Little Cascapedia R., July 29 and 30, 1904, *Collins, Fernald & Pease*; plati res, R. Petite Cascapedia, *Victorin, Rolland &*



Map 17. Eastern Range of *AGROPYRON TRACHYCAULUM*, var. *NOVAE-ANGLIAE*.

collins, *Fernald & Pease*; gravelly beaches and flats of Bonaventure R., August 5-8, 1904, *Collins, Fernald & Pease*; gravel beaches and bars, Little Cascapedia R., July 29 and 30, 1904, *Collins, Fernald & Pease*; plati res, R. Petite Cascapedia, *Victorin, Rolland &*

Jacques, no. 33,282; trap cliff, Tracadigash Mt., Carleton, July 24, 1904, *Collins, Fernald & Pease*; shore, Tadousac, August 6, 1892, *Kennedy*; Cache R., Lac Tremblant, August 2, 1922, *Churchill*; Perkins, Papineau Co., *Malte*, no. 119,241; Mt. King, près de Hull, *Victorin*, no. 15,261; Blue Sea Lake, Hull Co., *Malte*, no. 119,246; Wakefield, *Malte*, no. 119,239; dry serpentine ledges and gravel, Black Lake, *Fernald & Jackson*, no. 12,027; ledges, Mt. Elephantis, Brome, July 30, 1902, *Churchill, Pease*. MAGDALEN ISLANDS: sandy sea-strand, Alright I., *Fernald, Long & St. John*, no. 6936. PRINCE EDWARD ISLAND: moist rich woods and springy larch swamp, Bloomfield, *Fernald, Long & St. John*, nos. 6940, 6941; larch swamp, Dundee, *Fernald, Long & St. John*, no. 6942. NOVA SCOTIA: rocky flood-plain of Barrasois R., *Nichols*, no. 339; crest of boulder and gravel barrier-beach, Great Bras d'Or, Grand Narrows, *Fernald & Long*, no. 20,106; talus of gypsum cliffs near Fivemile R., *Pease & Long*, no. 20,102; sea-shore thicket, Port Mouton, *Bissell & Graves*, no. 20,105. NEW BRUNSWICK: Dalhousie, *Malte*, no. 119,247. MAINE: cedar swamp, Blaine, September 7, 1896, *Fernald*; Caribou bog, Crystal, August 16, 1900, *Fernald*; rock-shelves, Mt. Kineo, *Cushman*, no. 1909; dry bank, Dead River, *Fernald*, no. 576 (type of *A. caninum*, var. *Hornemanni*, f. *pilosifolium* Pease & Moore); dry rocky woods, Lubec, *Fernald*, no. 1366; granite ledges, Jordan Bluffs, Mt. Desert I., *Stebbins*, no. 625; ledgy shore, Dark Harbor, Islesboro, *Woodward, Bissell & Fernald*, no. 8817; Elwell Point, South Thomaston, *Bissell, Fernald & Chamberlain*, no. 8818; beach, Monhegan Island, August 8, 1921, *Churchill*; rocky woods, York, *Fernald & Long*, no. 12,732. NEW HAMPSHIRE: dry open ledges, Diamond Peaks, Dartmouth College Grant, *Pease*, no. 10,501; dry shaded cliffs, Devil's Slide, Stark, *Pease*, no. 17,448; dry roadside, West Milan, *Pease*, no. 13,791; dry gravelly soil, Gorham, *Pease*, no. 12,208; copse, Randolph, *Pease*, no. 1730; roadside, Whitefield, *Pease*, no. 14,426; talus, Mt. Webster, *Pease*, no. 11,722; roadside, Carroll, *Pease*, no. 16,590; among rocks, Jackson, July 10, 1880, *J. A. Allen*; dry woods, Three Mile I., Meredith, *Pease*, no. 2515; in sphagnum, Alstead, *Fernald*, no. 240. VERMONT: Willoughby Mt., *Eggleston*, no. 2177 (from TYPE station, acc. to label); Willoughby cliffs, August 10 and 12, 1883, July 24, 1886, *Faxon*; North Slide, Willoughby Mt., August 15, 1896, *Faxon*; base of Willoughby Mt., July 3, 1894, *Grout & Eggleston*, August 1, 1894, *Williams*; 4th of July Slide, Willoughby, July 1, 1896, *Kennedy*, August 15, 1896, *Faxon*; Smuggler's Notch, Mt. Mansfield, August 9, 1877, *Faxon*, July 10, 1894, *Eggleston*; dry ledge, South Burlington, June 27, 1912, *Knowlton*. MASSACHUSETTS: Pettingill's swamp, Newbury, August 12, 1897, *A. A. Eaton*; rocky woods, Shelburne Falls, July 6, 1921, *Churchill*; limestone hill near Harmon Pond, Sheffield, *Hoffmann*. CONNECTICUT: dry rocky woods (granitic), Sharon, *Weatherby*, no. 4799; dry rocky open woods (granitic), Canaan, *Weatherby*, no. 4145. NEW YORK: Wallface Mt., alt. 3000 ft., *House*,

no. 9533; Dutchess Co., *Hoysradt*; Watertown (as *A. repens*, var. *glaucum*) *A. Gray*, N. Am. Gram. Cyp. no. 128; Brownsville, June 30, 1859, *Wm. Boott*; dry open woods, Danby, *Eames & MacDaniels*, no. 3564. ONTARIO: Britannia, *Malte*, no. 119,242; Kingston, July 27, 1897, *Fowler*; Peninsula, Lake Superior, *Malte*, no. 107,866. MICHIGAN: Isle Royale, *Cooper*, no. 176; Alpena, July 22, 1876, *H. Gillman*; Cheboygan, August, 1890, *Kofoed*. WISCONSIN: Solon Springs, August 14, 1915, *Allen & Davis*. MANITOBA: Lake Winnipeg Valley, 1857, *Bourgeau*. MINNESOTA: sand, aspen grove, North Boundary, Hubbard Co., *M. L. Grant*, no. 2915; Duluth, August 1, 1888, *Vasey* (type of *A. tenerum ciliatum* Scribn. & Sm., consequently of *A. tenerum trichocoleum* Piper, *A. caninum*, var. *tenerum*, f. *ciliatum* (Scribn. & Sm.) Pease & Moore and *A. trachycaulum*, var. *trichocoleum* (Piper) *Malte*; type in U. S. Nat. Herb.). SASKATCHEWAN: Whitehorse Lake, *Herriot*, no. 72,890; Carleton House, *Richardson*. SOUTH DAKOTA: Belle Fourche, *Griffiths*, no. 389a. NEBRASKA: Loup City, *J. M. Bates*, no. 5219. ALBERTA: Cataract Creek, *S. Brown*, no. 1482; Edmonton, *Malte*, no. 151,819; near Banff, July 14, 1891, *J. Macoun*. WYOMING: Pine Bluffs, *Nelson*, no. 3628, in part; steep slopes, Bridger Peak, *Goodding*, no. 1939; Bull Camp, Big Horn Mts., *T. A. Williams*, no. 2771. COLORADO: Arboles, *Baker*, no. 145; vicinity of Mt. Carbon, *Tidestrom*, nos. 3918, 4041. NEVADA: Ruby Valley, alt. 6000 ft., *Watson*, no. 1330; grassy flats, alt. 6300 ft., Gold Creek, *Nelson & Macbride*, no. 2096.

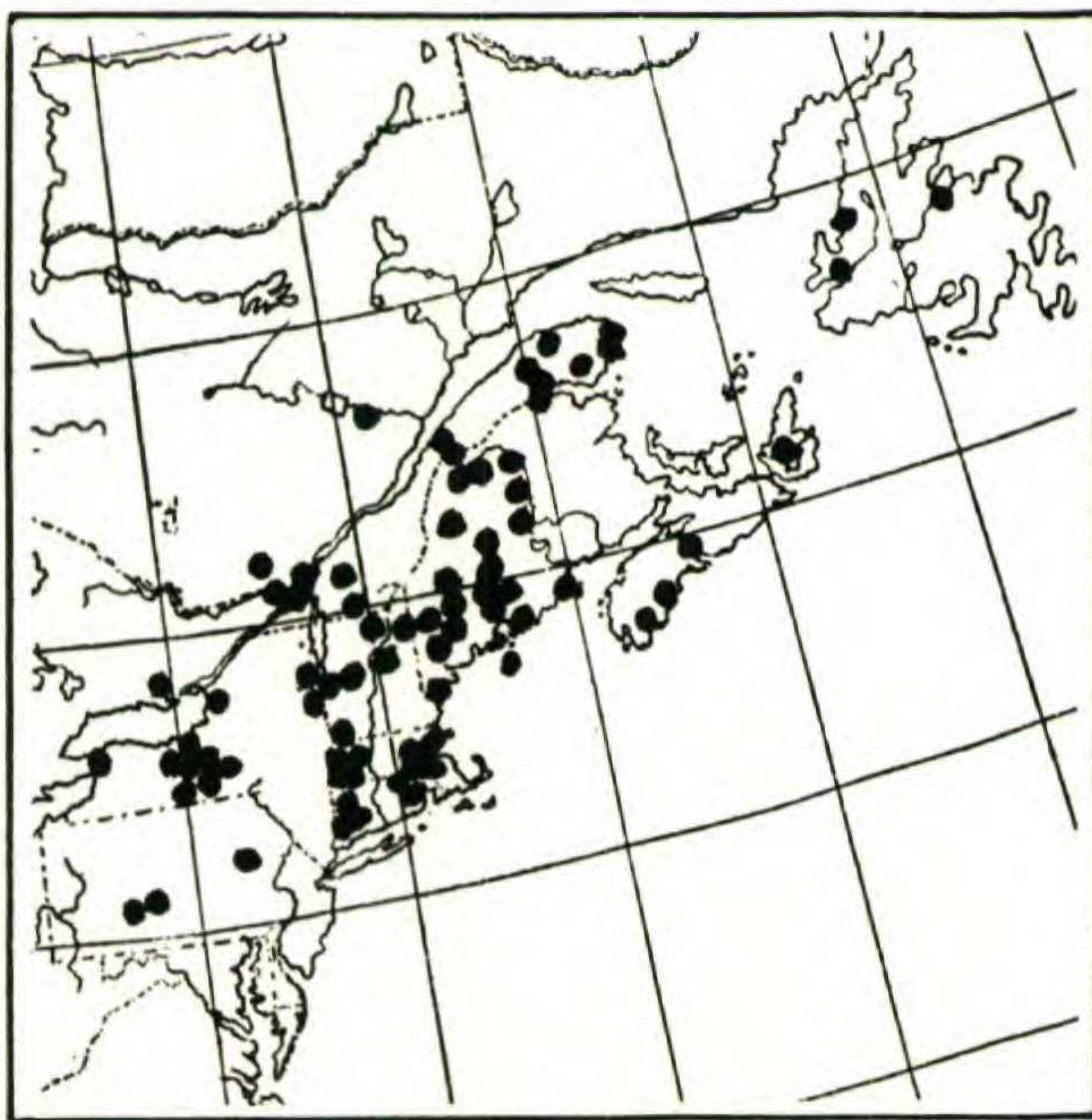
The individuals with trichomes present on some sheaths or blades have been called:

A. tenerum ciliatum Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 30 (1897). *A. tenerum trichocoleum* Piper, Bull. Torr. Bot. Cl. xxxii. 546 (1905). *A. caninum*, var. *tenerum*, f. *ciliatum* (Scribn. & Sm.) Pease & Moore, RHODORA, xii. 72 (1910). *A. caninum*, var. *Hornemanni*, f. *pilosifolium* Pease & Moore, l. c. 75 (1910). *A. trachycaulum*, var. *trichocoleum* (Piper) *Malte*, Ann. Rep. 1930, Nat. Mus. Can. 45 (1932).

The frequent glaucous state has apparently received no special designation.

Var. GLAUCUM (Pease & Moore) *Malte*, Ann. Rep. 1930, Nat. Mus. Can. 47 (1932). *A. caninum*, f. *glaucum* Pease & Moore, RHODORA, xii. 71 (1910). *A. trachycaulum*, var. *caerulescens* *Malte*, l. c. (1932). PLATE 244, FIGS. 1-4, and MAP 18.—Rocky or gravelly shores, thickets, open woods and bogs, in basic to acid soils, Newfoundland to southern British Columbia, south to southern New England, Pennsylvania, Michigan, Wisconsin, Minnesota, Nebraska, Colorado, Nevada and California. From a large representation the following are cited as characteristic. NEWFOUNDLAND: ledges, talus and gravel by Exploits R., Bishop Falls, *Fernald & Wiegand*, no. 4684; shelves and talus of diorite cliffs, Western Head, Bonne Bay, *Fernald, Long &*

Fogg, no. 1284; boggy woods, Stephenville, *Fernald & Wiegand*, no. 2691. QUEBEC: St. John (or Douglastown) R., August 23, 1904, *Collins, Fernald & Pease*; sur les graviers, R. Dartmouth, *Victorin et al.*, no. 17,832; gravelly beach of R. Ste. Anne des Monts, *Fernald & Collins*, nos. 170, 170a; gravelly beaches and flats, Bonaventure R., August 5-8, 1904, *Collins, Fernald & Pease*; sur les graviers de la rivière, Matapedia, *Victorin*, no. 26,464; slaty ledges by Matapedia R., Assemetquagan, *Fernald & Pease*, no. 24,911; rocky bank, St. Alphonse, Chicoutimi Co., August 6, 1902, *Williams & Fernald*; margin of Bic R., Bic, *Fernald & Collins*, no. 915; Rivière du Loup, 1860, *Chas. Pickering*, July 21, 1861, *Wm. Boott*; Anse à Persil, Rivière du Loup, *Victorin*, no. 98; shore of Boundary Lake, Ka-



Map 18. Eastern Range of AGROPYRON TRACHYCAULUM, var. GLAUCUM.

mouraska, July 31, 1878, *Pringle, Horsford*; Buckingham, *Malte*, no. 119,244; Ile Lemieux, R. Ottawa, *Victorin*, no. 15,262; pinière de la Trappe, Oka, *Victorin & Rolland*, no. 33,140; dry woods, Mt. Beloeil, *Pease*, no. 12,953; Elephantis Landing, Brome, *Pease*, no. 147. NOVA SCOTIA: thicket at upper border of gravel beach, Great Bras d'Or, Kidstone I., *Fernald & Long*, no. 20,100; thickets and upper border of shingly beach, Shubenacadie Grand Lake, *Fernald, Bartram & Long*, nos. 23,338,

23,339; wet thickets and swales, Lahave R., Bridgewater, *Fernald & Long*, no. 23,341; crest of barrier beach, East Jordan, *Fernald & Long*, no. 23,340. NEW BRUNSWICK: Junction of Matapedia and Restigouche Rivers, *Malte*, nos. 119,249, 119,251; Grand Falls, August 13, 1873, *Wm. Boott*; Lily Lake, St. John, August 10, 1873, *Wm. Boott*. MAINE: shore of St. John R., Fort Kent, *Pease*, no. 2579; gravelly shores, Aroostook R., Fort Fairfield, *Fernald*, no. 196; cedar swamp, Mars Hill, *Fernald*, no. 575; recent clearings and railroad embankments, Houlton, *Fernald & Long*, no. 12,728; open woods, City Camp to Roebar's, Wassataquoik R., July 17, 1900, *Fernald*; argillaceous ledges by Penobscot R., Winn, *Fernald & Long*, no. 12,727; bogs, Oldtown, July, 1890, *F. P. Briggs*; exposed argillaceous ledges along Penobscot R., Hampden, *Fernald & Long*, no.

12,731; thicket above springy, limy gravel-beach of St. John R., Township ix, Range 17, Somerset Co., *St. John*, no. 2142; dry river-thicket, Mercer, August 6, 1913, *Knowlton*; open woods, Farmington, *Fernald*, no. 574; thin soil on ledges, Hartford, *Parlin*, no. 1427; calcareous strand, Kelly Point, Pembroke, July 31, 1909, *Fernald*, no. 1367 (TYPE of *A. caninum*, f. *glaucum* Pease & Moore, consequently of *A. trachycaulum*, var. *glaucum* (Pease & Moore) Malte); crevices of dry granite, Kelly Point, Pembroke, *Fernald*, no. 1368; rocks, Winter Harbor, *Stebbins*, no. 3913; deciduous hillside-woods, Dedham, *Fernald & Long*, no. 12,729; granite ledges, Frankfort, *Fernald & Long*, no. 12,730; wet bank in woods, Rockland, *C. A. E. Long*, no. 662; crevices of cliff, Monhegan Island, August 10, 1921, *Churchill*; wooded terrace of Kennebec R., Vassalboro, *Fernald*, no. 12,726; North Berwick, *Parlin*, no. 571. NEW HAMPSHIRE: railroad embankment, Randolph, *Pease*, nos. 16,887, 17,195, 19,847; near Upper Baker Pond, Piermont, August 1, 1908, *Williams*. VERMONT: Willoughby, July 21, 1898, *Kennedy*; Twin Mt., West Rutland, *Eggleston*, no. 2473; serpentine outcrop, Roxbury, July 18, 1916, *E. J. Winslow*; cliffs, North Pownal, August 1, 1898, *Churchill*. MASSACHUSETTS: Major Heywood path, Concord, July 1, 1859, *H. D. Thoreau*; Conantum Cliff, Concord, *E. S. Hoar*; dry rocky (diorite) hillside-woods, Horn Pond Hill, Woburn, *Fernald & Long*, no. 8815; rock in woods, Stoneham, July 4, 1894, *W. P. Rich*; High Rock woods, Needham, June 22, 1890, *T. O. Fuller*; damp thicket east of Morse's Pond, Wellesley, July 20, 1912, *Wiegand*; Neponset meadows, Canton, June 22, 1899, *Kennedy*; woods, Ashfield, July 19, 1909, *Williams*; dry rocky upland woods, North Adams, *Fernald & Long*, no. 8816; rocky summit, West Stockbridge Mt., July 18, 1911, *Hoffmann*; rocky ledge, slope of Monument Mt., Great Barrington, July 6, 1906, *Hoffmann*; limestone ledge, Sheffield, July 30, 1914, *Hoffmann*. CONNECTICUT: Wauregan, *J. L. Sheldon*, no. 657; dry thicket, Somers, July 20, 1904, *Bissell*; roadside bank, Union, *Weatherby*, no. 4776; moist meadow, Waterbury, *Blewitt*, no. 324; dry ledge, Waterbury, *Blewitt*, no. 3637; low wet field, Brookfield, *Blewitt*, no. 1885; sphagnum swampy meadow, Bethel, *Eames*, no. 10,973. NEW YORK: thin soil on rocks, Peaked Mt., West Fort Ann, July 16, 1918, *Burnham*; Glen Lake, September 20, 1916, *Burnham*; Axton, July 14, 1899, *Rowlee, Wiegand & Hastings*; Watertown, *A. Gray*, N. Am. Gram. Cyp. no. 129; open woods, Thatcher's Pinnacle, Danby, *Metcalf*, no. 5850; dry woods, Estey's Glenn, Lansing, *Metcalf*, no. 5848; dry scrubby hillside, Caroline, *Wiegand*, no. 9283; rocky banks, Enfield, *Metcalf*, no. 5849; open woods, Ithaca, *Metcalf*, no. 5847; Sullivan Hill (on some labels "Crest of Mt. Zoar"), Chemung Co., *T. F. Lucy*, no. 11,603; Penn Yan, *Sartwell*; marl openings, Bergen Swamp, *Wiegand*, no. 9282; Buffalo, *Clinton*; Niagara Falls, July, 1836, *Carey*. PENNSYLVANIA: Pocono Mts., August 2, 1860, *Porter*; (Porter, on his label, also reports it from barrens of Huntingdon Co. and from Blair

Co.). ONTARIO: dry rocky ground, Hastings Co., June 2, 1865, *J. Macoun*; beach of Agawa R., Frater, *Pease*, no. 18,068. MICHIGAN: Isle Royale, *Cooper*, no. 175; bluffs, Keweenaw Co., *Farwell*, no. 760; Sulphur I., Thunder Bay, July 13, 1895, *C. F. Wheeler*; low sandy woods, Bay Port, September 10, 1902, *C. R. Ball*; very dry and poor ground in woods, Sand Point, Huron Co., *C. K. Dodge*, no. 22; Jackson, July 11, 1838, *Houghton*. WISCONSIN: beach of L. Michigan, Sturgeon Bay, *Schuette*, no. 155; Scott, Brown Co., July 10, 1898, *Schuette*; river-bank, Allouez, July 17, 1882, *Schuette*; Beloit, 1860, *T. J. Hale*; Wild Rose, July 3, 1918, *J. J. Davis*. MINNESOTA: sand, aspen clearing, Clearwater Co., *M. L. Grant*, no. 3119; rocks, Thomson, *Sandberg*, no. 407; wooded slope, sandstone outcrop, Sheldon Valley, *Rosendahl*, no. 3816. NEBRASKA: wet meadow, near Whitman, Grant Co., *Rydberg*, no. 1617. ALBERTA: small meadow, Buffalo Prairie, Jasper Park, *J. M. Macoun*, nos. 98,043, 98,044; N. E. Branch of Saskatchewan, *S. Brown*, no. 1497; Banff, *Malte*, no. 108,310 (var. *caerulescens* Malte, cited by him). MONTANA: East Gallatin swamps, alt. 5000 ft., *Rydberg*, no. 3191. WYOMING: Cache Creek, *Tweedy*, no. 625; Sundance, *T. A. Williams*, no. 2862; Fort Bridger, August 5, 1873, *Porter*. COLORADO: Twin Lakes, *J. Wolf*, no. 1168; Canyon City, alt. 5300 ft., Fremont Co., *Shear*, no. 960; dry soil among bushes, alt. 7000 ft., Mancos, *Baker, Earle & Tracy*, no. 440. IDAHO: dry soil among rocks, St. Anthony, *Merrill & Wilcox*, no. 130. NEVADA: King's Canon, alt. 1700–2000 m., Ormsby Co., *Baker*, no. 1286. CALIFORNIA: open woods, Idyllwild, San Jacinto Mts., *M. F. Spencer*, no. 1231. WASHINGTON: dry slopes near Conconully, Okanogan Co., *J. W. Thompson*, no. 6941. BRITISH COLUMBIA: Cameron Lake, Vancouver I., *W. R. Carter*, no. 950; Comox, Vancouver I., *Malte*, no. 107,855 (type of var. *caerulescens* Malte).

The earliest varietal name applicable to the common American *Agropyron* "*caninum*" is var. *glaucum*, a bit inappropriate, since most of the material is not strikingly, if at all, glaucous. The common, green and glabrous phases of the plant are:

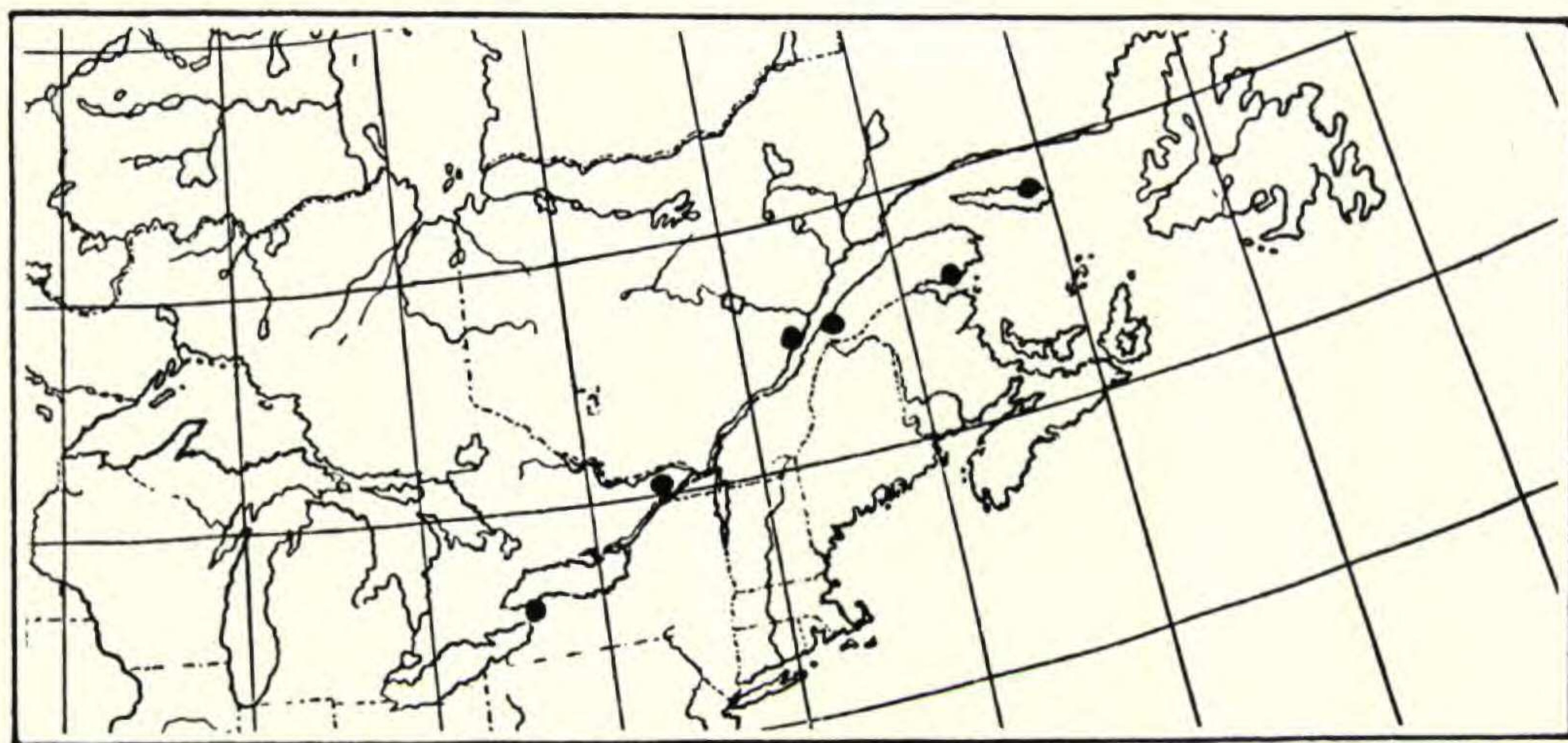
A. caninum of most American authors, not *A. caninum* (L.) Beauv. of Eurasia.

Triticum subsecundum Link, Hort. Bot. Berol. ii. 190 (1833).

Individuals of the green plant with more or less pubescence on some of the sheaths or blades have been called *A. caninum*, f. *pubescens* Pease & Moore, l. c. (1910). The plants examined by them have glabrous culms and variable, though not excessive pubescence on the foliage. They took their name from *A. caninum pubescens* Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 29 (1897). The type of Scribner & Smith's subspecies, most kindly loaned me by Professor Hitchcock, is a very extreme variation, if not another species, quite

unlike anything else which I have seen: with blades and sheaths all densely villous-tomentose, the tomentum also on the culms. No other material of the aggregate *A. trachycaulum* has been seen with positively pubescent culms. In view of the constancy of this character in species of *Muhlenbergia*, *Bromus*, and in some other genera of the *Gramineae* the rare western plant deserves further attention.

Var. UNILATERALE (Cassidy) Malte, Ann. Rep. 1930, Nat. Mus. Can. 46 (1932), in part (including name-bringing synonym). *A. Richardsoni* Schrad. Linnaea, xii. 467 (1838). *A. unilaterale* Cassidy, Colo. State Agric. Coll. Expt. Sta. Bull. no. 12: 63 (1890), not *A. unilaterale* Beauv. Agrost. 102 (1812). *A. caninum*, var. *unilaterale* (Cassidy) Vasey, Contrib. U. S. Nat. Herb. i. 279 (1893). *A. caninum*,



Map 19. Eastern Range of AGROPYRON TRACHYCAULUM, var. UNILATERALE.

f. *violascens* Ramaley, Geol. Nat. Hist. Surv. Minn.—Minn. Bot. St. no. 9: 3, 107 (1894). *A. violaceum*, f. *caninoides* Ramaley, l. c. 9, 108 (1894). *A. violascens* (Ramaley) Beal, Grasses N. Am. ii. 635 (1896). *A. caninoides* (Ramaley) Beal, l. c. 640 (1896). *A. caninum*, var. *Richardsoni* (Schrad.) M. E. Jones, Contrib. West. Bot. xvi. 18 (1912). *A. trachycaulum*, var. *Richardsoni* (Schrad.) Malte in H. F. Lewis, Can. Field-Nat. xlv. 201 (1931). PLATE 244, FIGS. 5-7, and MAP 19.—Meadows, thickets and limy rocks, borders of Gulf and lower River St. Lawrence, Quebec; Ontario and western New York to British Columbia, south to Wisconsin, Iowa, South Dakota, Colorado, Nevada and Oregon. QUEBEC: sur les platières, Riv. au Saumon, Anticosti, *Victorin & Rolland*, no. 27,886, as *A. repens*; sur les talus secs, R. Natiskotek, Anticosti, *Victorin & Rolland*, no. 27,895 (transition to var. *majus*); alluvial islands at mouth of Bonaventure R., August 4, 1904, *Collins, Fernald & Pease*; sur les îlots cambriens dits "Les Razades," Trois Pistoles, *Victorin, Rolland & Jacques*, no. 34,008;

vicinity of Cap à l'Aigle, *J. Macoun*, no. 68,982 (approaching var. *glaucum*). MAINE: in agris (doubtless introduced in western wool¹), North Berwick, June 24, 1898, *Parlin*. NEW YORK: Buffalo, *Clinton*. ONTARIO: Kemptville, *Malte*, no. 119,243. WISCONSIN: railroad track to Murphy's mill, Green Bay, July 8, 1897, *Schuette*; Scott, Brown Co., June, 1885, *Schuette*. IOWA: Little Rock, *C. R. Ball*, no. 554; Jewell Junction, *G. W. Carver*, no. 255. NORTH DAKOTA: prairies, Leeds, July 8, 1901, *Lunell*. SOUTH DAKOTA: Brookings, July 10, 1894, *Thornber*. SASKATCHEWAN: without locality, 1858, *Bourgeau*. ALBERTA: Dunvegan, Peace R., *J. M. Macoun*, no. 59,546; Brazeau, *S. Brown*, no. 1432; Devil's Head Lake, August 3, 1891, *J. Macoun*; Banff, *Butters & Holway*, no. 313. MONTANA: dry hillsides, Hound Creek Valley, alt. 4500 ft., *Scribner*, no. 422 (cotype of *A. Richardsoni ciliatum* Scribn. & Sm., consequently of *A. caninum*, var. *unilaterale*, f. *ciliatum* (Scribn. & Sm.) Pease & Moore and of *A. trachycaulum*, var. *ciliatum* (Scribn. & Sm.) Malte); Dry Fork of Belt Creek, *Rydberg*, no. 3352 (one individual green, one glaucous). WYOMING: Laramie, *E. D. Merrill*, no. 23. COLORADO: wet ground in the higher mountains, near Golden City, *Greene*, no. 446; Veta Pass, 1886, *Vasey*; Dillon, *Shear*, no. 1067; alpine, moist bottoms, Hahn's Peak, Routt Co., *Goodding*, no. 1705. NEVADA: Incline, Lake Tahoe, *P. B. Kennedy*, no. 1439. OREGON: Dale's, Blue Mts., *Griffiths & Hunter*, no. 111. WASHINGTON: Loomis, *Griffiths & Cotton*, no. 340. BRITISH COLUMBIA: Field, *J. Macoun*, no. 64,790; Comox, *J. Macoun*, no. 50.

Individuals with more or less pubescence on at least the lowest sheaths have been called:

A. Richardsoni ciliatum Scribn. & Sm. U.S. Dept. Agric. Div. Agrost. Bull. no. 4: 29 (1897). *A. caninum*, var. *unilaterale*, f. *ciliatum* (Scribn. & Sm.) Pease & Moore, RHODORA, xii. 76 (1910). *A. trachycaulum*, var. *ciliatum* (Scribn. & Sm.) Malte, l. c. 47 (1932).

Although Cassidy seems to have left no type (acc. to personal letter from Professor Ernest C. Smith) to stand for *Agropyron unilaterale*, his description can have been based on nothing else than the long-awned ("2 inches") *A. Richardsoni*; therefore, the inappropriate (or at least undistinctive) name *unilaterale*, as the first one used in the varietal category, has to be maintained.

THE AMERICAN VARIATIONS OF AGROPYRON REPENS.—The ubiquitous *Agropyron repens* (L.) Beauv. is excessively variable and it has repeatedly been segregated into minor species and varieties. As it occurs in North America, apparently indigenous along the coast from

¹ Along with *Bromus marginatus* Nees, *Puccinellia Nuttalliana* (Schultes) Hitchc., *Bouteloua* spp., *Chloris* spp., *Sporobolus* spp.; *Monolepis chenopodioides* Moq., *Lappula Redowskii* (Hornem.) Greene, var. *occidentalis* (Wats.) Rydb., *Aster frondosus* (Nutt.) T. & G., *Hymenatherum aureum* Gray and many other western plants thus locally introduced.—See J. C. Parlin, RHODORA, vi. 81 (1904).

Newfoundland and the lower St. Lawrence to New England and introduced as an obnoxious weed in eastern Canada and the north-eastern States and to a minor degree in the Northwest, it appears in several striking forms. Although conspicuous in their extremes, these all seem to intergrade; and essentially all of them may have either green or glaucous or pilose- or glabrous-sheathed phases. Such divergences are often very striking to the eye but as these tendencies are found indiscriminately in the awnless or long-awned, broad-glumed or narrow-glumed forms of the species I cannot look upon them as of taxonomic importance comparable with the variations of the spikelets.

Two very marked trends occur in the glumes. In the majority of weed-colonies in the East the glumes are oblong to narrowly elliptic and broadly scarious-margined (PLATE 245, FIGS. 1 and 2). In the larger mass of material of the sea-beaches, though sometimes in the weedy plants of the interior, the glumes are lanceolate and prolonged from near the middle to the tapering tip and with narrower or inrolling margins (FIGS. 3 and 4). In each of these series the rachis may be glabrous or pilose and the lemmas awnless or long-awned. It is, therefore, very difficult to interpret the many European descriptions which, emphasizing one point (the pilose rachis or the presence of awns, for instance), ignore the others. But, since it is desirable to have some names by which to designate our forms, I am appending the following wholly tentative arrangement of them, distinctly understanding that the names may eventually have to be altered, when a series is closely studied in connection with the European types. The two major trends I am treating as true varieties; the parallel variations under them seem better considered as forms.

- a. Glumes oblong, rounded or rather abruptly narrowed at apex, with broad scarious margin. . . . b.
- b. Rachis glabrous except for ciliate edges. . . . c.
- c. Glumes and lemmas blunt, acute or merely subulate-tipped. *A. repens* (typical).
- c. Glumes or especially the lemmas definitely awned. . *Forma aristatum*.
- b. Rachis pilose or hirsute. . . . d.
- d. Glumes and lemmas blunt, acute or merely subulate-tipped. *Forma trichorrhachis*.
- d. Glumes and lemmas definitely awned. *Forma pilosum*.
- a. Glumes lanceolate, gradually tapering from near the middle to the apex; margin narrow or inrolled. . . . e.
- e. Rachis glabrous except for ciliate edges. . . . f.
- f. Glumes and lemmas blunt, acute or merely subulate-tipped
Var. *subulatum*.
- f. Glumes and especially the lemmas definitely awned
Forma Vaillantianum.
- e. Rachis pilose or hirsute. . . . g.